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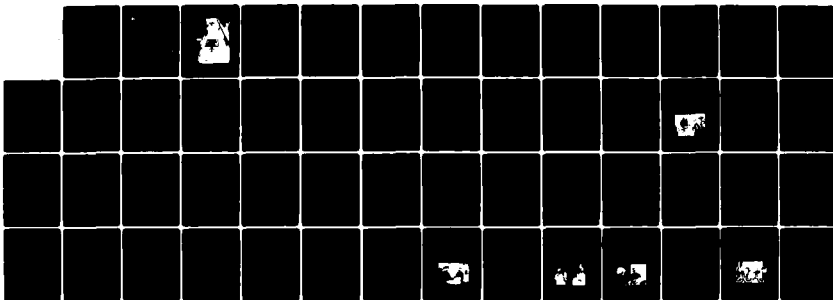
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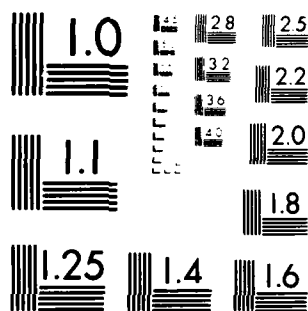
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## SUMMARIES OF RESEARCH

FISCAL YEAR 1982

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### NAVAL DENTAL RESEARCH INSTITUTE

Naval Medical Research and Development Command  
Bethesda, Maryland

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GREAT LAKES, ILLINOIS 60088

SUMMARIES OF RESEARCH  
Fiscal Year 1982

These summaries cover research carried out from 01 October 1981 through 30 September 1982.

This document has been approved for public release; its distribution is unlimited.

Approved and released by:

*G. E. Clark*

G. E. CLARK  
Captain, DC, USN  
Commanding Officer



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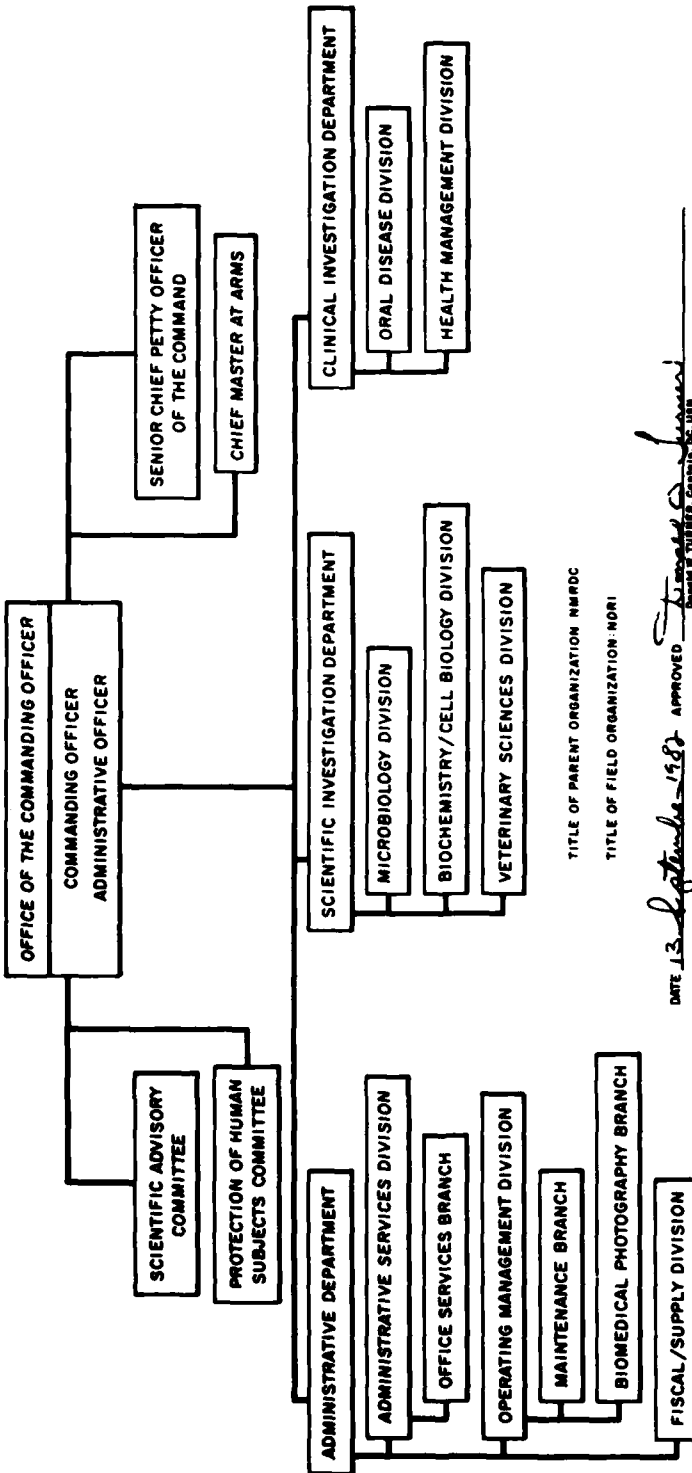
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# NAVAL DENTAL RESEARCH INSTITUTE



TITLE OF PARENT ORGANIZATION: NMRDC

TITLE OF FIELD ORGANIZATION: NDRI

DATE: 13 September 1987 APPROVED: *[Signature]*  
 Dennis W. Turner, Captain, DC, USN

## MISSION

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### COMMAND

The Naval Dental Research Institute was officially established 01 January 1967. The command was developed from the Dental Research Facility, which was a Division of the Dental Department of the Naval Administrative Command, Naval Training Center, Great Lakes.

### MISSION

The mission of the Institute is to conduct research, development, test and evaluation in dental and allied sciences, with particular emphasis on problems of dental and oral health in Navy and Marine Corps populations and on problems of fleet and field dentistry.

### PERSONNEL

As of 30 September 1982, there were on board 13 commissioned officers, 15 civilian employees, and 19 enlisted members, including assigned Air Force members.

### ORGANIZATION

The Institute has undergone some reorganization since 1967. The current organization of three major Departments is reflected on the preceding page. The Scientific Investigation Department consists of the Microbiology, Biochemistry/Cell Biology, and Veterinary Sciences/Pathology Divisions. Respectively, they carry out required microbiological, serological and bacteriological analysis; biochemical studies of etiological agents and of host factors involved in oral diseases; assistance, advice and preparation of specimens for histological analysis; and research in the field of laboratory animal medicine and dentistry. The Clinical Investigation Department conducts research related to prevention and treatment of dental and oral diseases with primary emphasis directed toward acute and chronic infections, problems of dento-alveolar trauma and injury, and the delivery of optimal dental care for the naval population. The Administrative Department provides the Institute with supply and fiscal services; library, general clerical services and manuscript preparations; photography and graphics; and equipment and facility maintenance, as well as special fabrications and instrumentation support.

FORMAL PRESENTATIONS OF RESEARCH MADE AT MEETINGS OF SCIENTIFIC SOCIETIES  
RESULTS REPORTED AND/OR DISCUSSIONS LED

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OCTOBER

SIMONSON, L. G. presented "Preventing Bacterial Adherence to Tooth Surfaces: An Enzymatic Approach" to the staff of NDRI.

TURNER, D. W. presented "Basic Immunology" to the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

TURNER, D. W. presented "Immunological Implications in Clinical Endodontics" to the staff of NDRI.

WALTER, R. G. presented "Role of Lactobacilli in the Progression of Dental Caries in Naval Recruits" at the University of Notre Dame, Notre Dame, Indiana.

NOVEMBER

BAYCAR, R. S. presented "The Biological Effects of Lasers" to the staff of NDRI.

TURNER, D. W. presented three seminars on immunology for the graduate students at Northwestern University, School of Dentistry, Chicago, IL.

TURNER, D. W. presented a seminar on immunology to the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

TURNER, D. W. presented "The Status of Dental Research in the Department of Defense" to the Chicago Section, American Association for Dental Research.

DECEMBER

AKER, F. presented "Impact of Disease Upon European History" to the staff of NDRI.

CLARK, G. E. presented "Treatment of Deep Carious Lesions in Naval Recruits" to the Cariology Group of the University of Minnesota, School of Dentistry, Minneapolis, Minnesota.

CLARK, G. E. presented "Overview of Naval Dental Research Institute Programs and Studies" at the Veterans Administration Medical Center, North Chicago, IL.

JANUARY

BAYCAR, R. S. presented "Stainless Steel Crown Placement in Adults" and "Clinical Assessment Criteria" to the Naval Regional Dental Center, Great Lakes, IL.

FORMAL PRESENTATIONS OF RESEARCH MADE AT MEETINGS OF SCIENTIFIC SOCIETIES  
RESULTS REPORTED AND/OR DISCUSSIONS LED (Continued)

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JANUARY (Continued)

CECIL, J. C. presented "Philosophy of Research Design" to the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

McWALTER, G. M. presented "Incision for Drainage, Trephination and Marsupialization" to the Dental Department staff of the Veterans Administration Medical Center, North Chicago, IL.

McWALTER, G. M. presented "Diagnostic Aids and Preparation for Emergency Endodontic Surgery" to the staff of NDRI.

SANTOS, A. presented "Oral Pathology: Review of Common Soft Tissue Lesions" to the staff of NDRI.

SCHROEDER, D. C. and COHEN, M. E. presented a seminar on research methodology to the Oral Surgery Department, Naval Regional Medical Center, Great Lakes, IL.

TURNER, D. W. presented two immunology lectures to the staff of NDRI.

TURNER, D. W. presented "Inflammation" to the Department of Periodontology, Northwestern University, Chicago, IL.

FEBRUARY

BAYCAR, R. S. presented a lecture on the portable cardboard dental chair to the American Society for Geriatric Dentistry, Chicago, IL.

CECIL, J. C. presented "Epidemiologic Examination Calibration" and "Navy Dental Research - How Can We Help You in the Clinics" to the Naval Regional Dental Center, Orlando, Florida.

McWALTER, G. M. presented "Periapical Curettage, Apicoectomy and Retrograde Filling" to the Veterans Administration Medical Center, North Chicago, IL.

McWALTER, G. M. taught a participation course in Molar Endodontics at the 117th Midwinter Chicago Dental Society Meeting, Chicago, IL.

POWELL, E. D. taught "Prevention of Sexual Harassment" sponsored by the Consolidated Civilian Personnel Office, Great Lakes, IL.

SANTOS, A. presented a table clinic "Oral Pathology Review" at the 117th Midwinter Chicago Dental Society Meeting, Chicago, IL.

SCHROEDER, D. C. was a panelist for the Women Officers' Network luncheon. The topic was "Navy Career Patterns".

SHKLAIR, I. L. presented "Streptococcus mutans and Dental Caries" to the staff of NDRI.

TURNER, D. W. presented four lectures on immunology to the staff of NDRI.

FORMAL PRESENTATIONS OF RESEARCH MADE AT MEETINGS OF SCIENTIFIC SOCIETIES  
RESULTS REPORTED AND/OR DISCUSSIONS LED (Continued)

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FEBRUARY (Continued)

WALTER, R. G. taught "Prevention of Sexual Harassment" sponsored by the Consolidated Civilian Personnel Office, Great Lakes, IL.

MARCH

The 60th General Session of the International Association for Dental Research meeting was held in New Orleans, Louisiana. Presentations were made by the following staff members:

- CECIL, J. C. presented "Longevity of Amalgam Restorations: A Retrospective View".
- CLARK, G. E. presented "Conservative Treatment of Deep Carious Lesions in Naval Recruits".
- COHEN, M. E. presented "Dental History Predictors of Caries Related Dental Emergencies".
- ESQUIRE, R. G. presented "Plaque Fluoride and Microbial Levels in Response to 0.05% NaF Rinsing".
- LAMBERTS, B. L. presented "Salivary Peroxidase System Components in Caries-Free and Caries-Active Subjects".
- SCHROEDER, D. C. presented "History of Retention and Extraction of Third Molars in Naval Personnel".
- SEROWSKI, A. presented "The Effect of Marine and Fresh Water Atmospheric Environments on Packaged Dental Instruments".
- SHKLAIR, I. L. presented "The Effect of Three Surfactants on Controlling Caries Activity in Hamsters".
- SIMONSON, L. G. presented "Effect of Saliva and Sucrose on Adherence of S. mutans to Insoluble Streptococcal Glucan".
- WALTER, R. G. presented "The Effect of T-10 Dextran on Caries and Plaque in Rats and Hamsters".
- ESQUIRE, R. G. and SHKLAIR, I. L. presented "Quantitation of Dental Plaque Bacteria in Relation to Caries Experience in Young Adults" at the American Society for Microbiology, Atlanta, Georgia.
- McWALTER, G. M. presented "Traumatic Injuries to the Teeth" at the Veterans Administration Medical Center, North Chicago, IL.
- SCHROEDER, D. C. presented "Emergency Drugs" to the dental staff of NDRI.
- TURNER, D. W. presented two lectures on immunology to the staff of NDRI.

FORMAL PRESENTATIONS OF RESEARCH MADE AT MEETINGS OF SCIENTIFIC SOCIETIES  
RESULTS REPORTED AND/OR DISCUSSIONS LED (Continued)

---

APRIL

AKER, F. presented a lecture on NBC Warfare for two Casualty Care courses sponsored by the Naval Regional Dental Center, Great Lakes, IL.

TURNER, D. W. presented a lecture on Navy Dental Research Programs to the Dental Reserve Officers (RADCOM-13).

TURNER, D. W. presented two lectures on immunology to the staff of NDRI.

MAY

AKER, F. presented a lecture on NBC Warfare for the Casualty Care course sponsored by the Naval Regional Dental Center, Great Lakes, IL.

AKER, F. presented a table clinic "Portable Dental Equipment" to the Great Lakes Dental Society, Great Lakes, IL.

AKER, F. presented "The Influence of Disease on European History" to the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

BAYCAR, R. S. presented a lecture on forensic dentistry to the Casualty Care course sponsored by the Naval Regional Dental Center, Great Lakes, IL.

BAYCAR, R. S., AKER, F. and SEROWSKI, A. presented a table clinic "Portable Cardboard Dental Chair" to the Great Lakes Dental Society, Great Lakes, IL.

COHEN, M. E. presented a table clinic "Dental History Predictors of Caries Related Dental Emergencies" to the Great Lakes Dental Society, Great Lakes, IL.

ESQUIRE, R. G. presented "Preventive Dentistry Update" to the United States Navy Officers Continuing Education Course for Preventive Dentistry and Patient Motivation at the Naval Regional Dental Center, San Diego, California.

McWALTER, G. M. presented "Periapical Curettage" to members of the Naval Dental Research Institute and Naval Regional Dental Center, Great Lakes, IL.

SEROWSKI, A. presented a table clinic on a portable cardboard dental chair to the Illinois Dental Society, Springfield, IL.

SEROWSKI, A. presented a table clinic on a portable dental chair system at the Wisconsin Dental Society meeting, Milwaukee, Wisconsin.

FORMAL PRESENTATIONS OF RESEARCH MADE AT MEETINGS OF SCIENTIFIC SOCIETIES  
RESULTS REPORTED AND/OR DISCUSSIONS LED (Continued)

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JUNE

ESQUIRE, R. G. presented "Epidemiology and Dental Disease Prevention in the Navy" at the Navy Preventive Dentistry Research Workshop, Washington, D.C.

ESQUIRE, R. G. presented "Distribution of Dental Disease in the Navy and Fluoride Rinsing Perspectives" to the staff of NDRI.

JULY

HYMAN, J. J. presented "Basic Computer Theory" to the staff of NDRI.

TURNER, D. W. presented "Immunological Implications in Periodontal Disease" to the staff of NDRI.

WALTER, R. G. presented "Hepatitis B" to the staff of NDRI.

AUGUST

DIEHL, M. C. presented "Paella: A View of Modern Spain" to the staff of NDRI.

DIEHL, M. C. conducted a discussion group "Computer Simulation Techniques" at the University of Wisconsin at Parkside, Wisconsin.

McWALTER, G. M. presented "Traumatic Injuries to the Teeth" to the staff of NDRI and personnel from the Veterans Administration Medical Center, North Chicago, IL.

PATCH, S. J. presented "Amalgam Crown Research and Hybrid Restorations" to the staff of NDRI.

SEPTEMBER

BENNY, J. A. was a member of the NEC Review Board at the Surgeon General's 14th Annual Specialty Advisory Conference Committee meeting, Bethesda, Maryland.

CLARK, G. E. presented "Permeability Factor" to the staff of NDRI.

COOPER, J. R. presented "Effects of Perinatal Kepone Exposure on Neuroleptic Development and Neuroendocrine Function in the Rat" at the International Conference on Neurotoxicology of Selected Chemicals, Chicago, IL.

KELLY, J. R. presented "Non-Precious Alloys for Use in Fixed Prosthodontics: A Review of Current Literature" to the staff of NDRI.

LAMBERTS, B. L. presented "Exploring Jupiter" to the staff of NDRI.

FORMAL PRESENTATIONS OF RESEARCH MADE AT MEETINGS OF SCIENTIFIC SOCIETIES  
RESULTS REPORTED AND/OR DISCUSSIONS LED (Continued)

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SEPTEMBER (Continued)

McWALTER, G. M. presented "1981-82 Overview of NDRI" to the Naval Regional Medical Center, Great Lakes, IL.

PORVAZNIK, M. presented information on electron microscopic work conducted at NDRI for the Naval Regional Medical Center Tumor Board, Great Lakes, IL.

WALTER, R. G. presented "Hepatitis B" at the In-Service Training Program sponsored by the Naval Regional Dental Center, Great Lakes, IL.

PARTICIPATION IN OTHER PROGRAMS

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OCTOBER

The American Dental Association National Convention held in Kansas City, Missouri was attended by:

AKER, F.	CLARK, G. E.
CECIL, J. C.	TURNER, D. W.

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

BAYCAR, R. S.	ESQUIRE, R. G.
CECIL, J. C.	McWALTER, G. M.

The Great Lakes Dental Society meeting was attended by the following personnel:

BAYCAR, R. S.	McWALTER, G. M.
ESQUIRE, R. G.	

AKER, F. attended the Student Clinicians of the American Dental Association meeting, Chicago, IL.

BAILEY, G. L. attended Instructor Training School, Service School Command, Great Lakes, IL.

CECIL, J. C. attended the American Association for Public Health Dentists meeting in Kansas City, Missouri.

ESQUIRE, R. G. attended three immunology lectures presented by the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

LARSON, E. W. attended a medical photography seminar in Dallas, Texas.

SCHROEDER, D. C. attended two lectures presented by the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

SHKLAIR, I. L. attended a lecture on oral infections at the Naval Regional Medical Center, Great Lakes, IL.

TAYLOR, S. L. attended Leadership and Management Training course, Service School Command, Great Lakes, IL.

NOVEMBER

A meeting of the Chicago Section of the American Association for Dental Research was attended by:

AKER, F.	ESQUIRE, R. G.	SHKLAIR, I. L.
BAYCAR, R. S.	LAMBERTS, B. L.	SIMONSON, L. G.
CECIL, J. C.	McWALTER, G. M.	TURNER, D. W.
CLARK, G. E.		

PARTICIPATION IN OTHER PROGRAMS (Continued)

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NOVEMBER (Continued)

BAYCAR, R. S. attended the annual meeting of the Association of Military Surgeons of the United States, San Antonio, Texas.

CLARK, G. E. attended a seminar on maxillofacial reconstruction at the Naval Regional Medical Center, Great Lakes, IL.

McWALTER, G. M. attended the E. D. Coolidge Study Club, Chicago, IL.

SCHROEDER, D. C. attended an American Heart Association workshop.

SCHROEDER, D. C. attended a meeting of the Women Officers' Network, Great Lakes, IL.

SCHROEDER, D. C. attended two lectures at the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

SEROWSKI, A. attended the Midwest Communication Electronics Convention, Chicago, IL.

DECEMBER

The Great Lakes Dental Society meeting was attended by the following personnel:

CLARK, G. E.  
McWALTER, G. M.  
SCHROEDER, D. C.

ESQUIRE, R. G. attended a short course "Preventive Dentistry and Patient Motivation" at the National Naval Dental Center, Bethesda, Maryland.

TURNER, D. W. attended the Alcohol Rehabilitation Service training course at the Naval Regional Medical Center, Great Lakes, IL.

JANUARY

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

BAYCAR, R. S.	SEROWSKI, A.
CECIL, J. C.	SIMONSON, L. G.
McWALTER, G. M.	TURNER, D. W.
SANTOS, A.	WALTER, R. G.
SCHROEDER, D. C.	

A meeting of the Illinois Society for Microbiology held at Northwestern University was attended by:

MERRELL, B. R.  
SANTOS, A.  
SHKLAIR, I. L.

## PARTICIPATION IN OTHER PROGRAMS (Continued)

### JANUARY (Continued)

TURNER, D. W. attended the In-Service Training Program, Naval Regional Dental Center, Great Lakes, IL.

TURNER, D. W. attended a dinner and award ceremony of the Lake County Chapter, Navy League, Great Lakes, IL.

### FEBURARY

The Great Lakes Dental Society meeting was attended by the following personnel:

AKER, F.	CLARK, G. E.
BAYCAR, R. S.	ESQUIRE, R. G.

The Chicago Dental Society Midwinter meeting in Chicago, Illinois was attended by the following personnel:

AKER, F.	ESQUIRE, R. G.	SANTOS, A.
BAILEY, G. L.	GOLDING, M. P.	SEROWSKI, A.
BAYCAR, R. S.	McCARATHY, T. P.	THOMAS, D. E.
BOCKOWSKI, S. W.	McWALTER, G. M.	TURNER, D. W.
CECIL, J. C.	REESE, W. V.	WALTER, R. G.

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

LAMBERTS, B. L.  
TURNER, D. W.

BAYCAR, R. S. attended a meeting of the American Society of Geriatric Dentistry, Chicago, IL.

CLARK, G. E. attended the Alcohol Rehabilitation Service training course, 15-26 February 1982, at the Naval Regional Medical Center, Great Lakes, IL.

LAMBERTS, B. L. attended the Lake Forest Section of the American Chemical Society meeting, Lake Forest, IL.

SCHROEDER, D. C. attended four lectures at the Dental Service, Naval Regional Medical Center, Great Lakes, IL.

### MARCH

The International Association for Dental Research 60th General Session held in New Orleans, Louisiana was attended by:

AKER, F.	LAMBERTS, B. L.	SEROWSKI, A.
BAYCAR, R. S.	McWALTER, G. M.	SHKLAIR, I. L.
CECIL, J. C.	MERRELL, B. R.	SIMONSON, L. G.
CLARK, G. E.	PEDERSON, E. D.	TURNER, D. W.
COHEN, M. E.	SANTOS, A.	WALTER, R. G.
ESQUIRE, R. G.		

PARTICIPATION IN OTHER PROGRAMS (Continued)

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MARCH (Continued)

The American Society for Microbiology annual meeting in Atlanta, Georgia was attended by:

ESQUIRE, R. G.  
SHKLAIR, I. L.

SEROWSKI, A. attended the National Design Engineering show and the American Society of Mechanical Engineers conference in Chicago, Illinois.

APRIL

A meeting of the Chicago Section of the American Association for Dental Research held at Great Lakes was attended by:

AKER, F.	LAMBERTS, B. L.
BAYCAR, R. S.	McWALTER, G. M.
CLARK, G. E.	SHKLAIR, I. L.
HYMAN, J. J.	WALTER, R. G.

The Great Lakes Dental Society meeting was attended by the following personnel:

ESQUIRE, R. G.  
HYMAN, J. J.  
TURNER, D. W.

CECIL, J. C. attended a Drug Abuse Prevention Program at the Naval Regional Dental Center, Great Lakes, IL.

COOPER, J. R. attended the annual meeting of the American College of Laboratory Animal Medicine, Gatlinburg, Tennessee.

HORTON, A. J. attended a course on Advanced Laboratory Animal Care at Brooks Air Force Base, Texas.

LAMBERTS, B. L. attended the Lake Forest section of Sigma Xi meeting at Lake Forest, Illinois.

WALTER, R. G. attended the Hepatitis B Conference sponsored by the American Dental Association and the University of Illinois, Chicago, Illinois.

MAY

A meeting of the Great Lakes Dental Society was attended by the following personnel:

AKER, F.	COHEN, M. E.
BAYCAR, R. S.	HYMAN, J. J.
CECIL, J. C.	McWALTER, G. M.
CLARK, G. E.	SEROWSKI, A.

PARTICIPATION IN OTHER PROGRAMS (Continued)

---

MAY (Continued)

A meeting of the Chicago Section of the American Association for Dental Research was attended by the following personnel:

AKER, F.	LAMBERTS, B. L.
CECIL, J. C.	SIMONSON, L. G.
CLARK, G. E.	WALTER, R. G.
HYMAN, J. J.	

A meeting for consultants to the Naval Regional Medical Center, Great Lakes Illinois was attended by:

CECIL, J. C.  
TURNER, D. W.

COOPER, J. R. attended the Operational Laboratory Animal Medicine Problems course at Brooks Air Force Base, Texas.

ESQUIRE, R. G. attended the Preventive Dentistry Continuing Education course at the Naval Regional Dental Center, San Diego, CA.

ESQUIRE, R. G. attended the Navy Preventive Dentistry Research workshop, Washington, D. C.

SEROWSKI, A. attended the Illinois Dental Society meeting in Springfield, Illinois.

SEROWSKI, A. attended the Wisconsin Dental Society meeting in Milwaukee, Wisconsin.

TURNER, D. W. attended the Surgeon General's Medical Department Commanding Officers conference in Bethesda, Maryland.

TURNER, D. W. attended a Naval Medical Research and Development Command conference in Bethesda, Maryland.

JUNE

SEROWSKI, A. attended the National Plastics Exposition at McCormick Place, Chicago, Illinois.

AUGUST

CLARK, G. E. attended PCO/PXO course in Leadership Management Education, Navy Amphibious School, Little Creek, Virginia.

LAMBERTS, B. L. attended the International Carbohydrate symposium in Vancouver, British Columbia, Canada.

PARTICIPATION IN OTHER PROGRAMS (Continued)

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SEPTEMBER

BENNY, J. A. attended the Surgeon General's 14th Annual Specialty Advisory Conference Committee meeting, Bethesda, MD.

BENNY, J. A. attended a meeting of the Northern Illinois Health Administrators' Forum, Great Lakes, IL.

COOPER, J. R. attended the International Conference on Neurotoxicology of Selected Chemicals, Chicago, IL.

ESQUIRE, R. G. attended the Lake County Dental Society meeting, Waukegan, Illinois.

KELLY, J. R. attended the Great Lakes Dental Society meeting.

SEROWSKI, A. attended the Laboratory Instrument and Equipment Conference and Exposition, Rosemont, Illinois.

SHKLAIR, I. L. attended the ADA animal model meeting on cariogenicity of foods, Chicago, Illinois.

WORK UNITS - FISCAL YEAR 1982

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- 61153N MR04120 MR0412002 0441 - Prevention of Dental Disease in Naval and Marine Corps Personnel by Inhibiting Plaque Accumulation
- 61153N MR04120 MR0412002 0444 - Study of the Adherence of Pathogenic Microorganisms to Dental Surfaces in Navy and Marine Corps Personnel
- 62758N F58524 MF5852404B 0027 - Development of Therapeutic Methods to Prevent Oral Diseases of Naval and Marine Corps Personnel
- 62758N MF58524 MF58524012 0030 - Monitoring the Oral Health Status of Naval Personnel
- 63706N M0095PN M0095PN003 3008 - Evaluation of Expedient Procedures for Treating Dental Pulp Disease in Naval Personnel
- 64771N M0933PN M0933PN002 0001 - Development of a Marine Corps Expeditionary Dental Shelter

INDEPENDENT RESEARCH WORK UNITS

- 61152N MR00001 MR0000101 0026 - The Relationship of Oral Health and Personnel Performance in Navy Recruits
- 61152N MR00001 MR0000101 0030 - Evaluation of Commercially Available Auxiliary Ballistic Protection Shields for Facial Combat Dress
- 61152N MR00001 MR0000101 0033 - The Potential Pathogenicity of Pseudomonas aeruginosa Isolates from Healthy Naval Personnel as a Source of Infection in Maxillofacial Combat Wounds
- 61152N MR00001 MR0000101 0034 - Preformed Stainless Steel Crowns and Pin-Retained Amalgam Restorations: A Comparative Clinical Study
- 61152N MR00001 MR0000101 0035 - Efficacy of Stannous Fluoride Mouthrinsing in Prevention of Dental Disease in Naval Personnel - Feasibility Study
- 61152N MR00001 MR0000101 0037 - Effect of Growth Factors, Plasma Fibronectin and Ascorbic Acid on Wound Repair
- 61152N MR00001 MR0000101 0038 - The Role of Lactobacilli in the Progression of Dental Caries in Naval Recruits
- 61152N MR00001 MR0000101 0039 - Clinical Problems Associated with Retention and Extraction of Third Molars in Naval Personnel
- 61152N MR00001 MR0000101 0040 - Evaluation of a Disease Risk Dental Recall System
- 61152N MR00001 MR0000101 0041 - Fibronectin in the Oral Cavity and Its Influence on the Adherence of Pathogenic Oral Bacteria

RESEARCH PROGRESS REPORTS - FY 1982

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NDRI-PR 81-09	Dental History Predictors of Caries Related Dental Emergencies
NDRI-PR 81-10	Summaries of Research - Fiscal Year 1981
NDRI-PR 81-11	A Comparison of Intraoral and Extraoral Radiological Technology
NDRI-PR 81-12	Research Abstracts of 1981
NDRI-PR 82-01	A New Method for the Detection and Assay of $\alpha$ -1, 3-Glucanases
NDRI-PR 82-02	The Current Status of New Attachment Therapy
NDRI-PR 82-03	Chemical Treatment of Diseased Root Surfaces <u>In vitro</u>
NDRI-PR 82-04	Fluoride Concentration in Dental Plaque of Naval Recruits With and Without Caries
NDRI-PR 82-05	Regeneration and Repair After Biologic Treatment of Root Surfaces in Monkeys. I. Facial Surfaces Maxillary Incisors
NDRI-PR 82-06	Purification and Properties of Endo-1, 3- $\alpha$ -D-Glucanase from <u>Pseudomonas</u>
NDRI-PR 82-07	Empirical Verification of Confidence Intervals Computed from Dental Data
NDRI-PR 82-08	Regeneration and Repair After Biologic Treatment of Root Surfaces in Monkeys. II. Proximal Surfaces Posterior Teeth

#### OTHER PUBLICATIONS

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- Aker, P., Serowski, A. and Bailey, G. L. A Comparison of Intraoral and Extraoral Radiological Technology. *Military Medicine* 146:803-806, 1981.
- Anderson, L. C., Lamberts, B. L. and Bruton, W. F. Salivary Polymorphisms in Caries-Free and Caries-Active Adults. *Journal of Dental Research* 61:393-396, 1982.
- Ferjentsik, E. and Aker, P. Barodontalgia: A System of Classification. *Military Medicine* 147:299-304, 1982.
- Lamberts, B. L., Simonson, L. G., Pederson, E. D. and Gaugler, R. W. A New Method for the Detection and Assay of  $\alpha$ -1, 3 Glucanases. *Analytical Biochemistry* 117:320-326, 1981.
- Meiers, J. C., Wirthlin, M. R. and Shklair, I. L. A Microbiological Analysis of Human Early Carious and Noncarious Fissures. *Journal of Dental Research* 61:460-464, 1982.
- Porvaznik, M., Cohen, M. E., Bockowski, S. W., Mueller, E. J. and Wirthlin, M. R. Enhancement of Cell Attachment to a Substrate Coated with Oral Bacterial Endotoxin by Plasma Fibronectin. *Journal of Periodontal Research* 17:154-168, 1982.
- Shklair, I. L. Natural Occurrence of Caries in Animals - Animals as Vectors and Reservoirs of Cariogenic Flora. Proceedings "Symposium on Animal Models in Cariology" (Ed. Tanzer, J. M.), Sp. Supp. Microbiology Abstracts, pp. 41-48, 1981.
- Simonson, L. G., Lamberts, B. L. and Reiher, D. A. Purification and Properties of Endo-1, 3- $\alpha$ -D-Glucanase from Pseudomonas. *Biochimica Biophysica Acta* 715: 189-195, 1982.
- Walker, R. I., Daily, O., Krasner, R., Merrell, B. R. and Porvaznik, M. The Relationship of Enteric Microorganisms to Causes of Morbidity and Mortality in Operational Situations: A Review. *Military Medicine* 147:15-22, 1982.
- Wirthlin, M. R., Shklair, I. L., Northerner, R. A., Shelton, S. W. and Bailey, G. L. The performance of Autoclaved High-Speed Dental Handpieces. *Journal of the American Dental Association* 103:584-587, 1981.

## DISTINGUISHED VISITORS

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### OCTOBER

Captain D. Nickelson, DC, USNR-R, University of Illinois, Pedodontic Department, Chicago, Illinois.

Captain R. A. Esposito, DC, USN, Naval Regional Dental Center, Great Lakes, Illinois.

Captain D. Short, DC, USN, Naval Regional Dental Center, Great Lakes, Illinois.

CDR E. T. Rippert, DC, USN, Dental Service, Naval Regional Medical Center, Great Lakes, Illinois.

CDR H. Towle, DC, USN, Naval Medical Research Institute, National Naval Medical Center, Bethesda, Maryland.

### NOVEMBER

Captain R. A. Esposito, DC, USN, Naval Regional Dental Center, Great Lakes, Illinois.

CDR T. Rocha, DC, USN, Naval Regional Dental Center, Great Lakes, Illinois.

Mr. J. Beutlich, Beutlich Pharmaceutical Company, Chicago, Illinois.

LCDR J. Thayer, Naval Military Personnel Command, Washington, D. C.

### DECEMBER

Captain E. B. Hancock, DC, USN, National Naval Dental Center, Bethesda, Maryland.

Captain W. Ludwick, DC, USN (Ret.), Wayzata, Minnesota.

### JANUARY

Captain D. Nickelsen, DC, USNR-R, University of Illinois, Pedodontic Department, Chicago, Illinois.

Captain L. M. Muldrow, DC, USN, Naval Regional Dental Center, Great Lakes, Illinois.

Colonel D. E. Ryan, USAF-R (DC), Oral and Maxillofacial Surgery, Milwaukee County Medical Complex, Milwaukee, Wisconsin.

### FEBRUARY

Mr. J. Beutlich, Beutlich Pharmaceutical Company, Chicago, Illinois.

The Department of Periodontal Research, University of Illinois, Dental School, Chicago, Illinois.

DISTINGUISHED VISITORS (Continued)

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FEBRUARY (Continued)

The Endodontic Department, Northwestern University, School of Dentistry,  
Chicago, Illinois.

Captain R. A. Esposito, DC, USN, Naval Regional Dental Center, Great  
Lakes, Illinois.

MARCH

Captain R. G. Shaffer, DC, USN, Commanding Officer, Naval Regional Dental  
Center, Great Lakes, Illinois.

Colonel Faye, U.S. Army, Fort Sheridan, Illinois.

APRIL

The staff of the Research Division, American Dental Association, Chicago,  
Illinois.

MAY

Colonel Dr. Aly El Mowafy of the Egyptian Army, Cairo, Egypt.

Captain E. P. Leonard, DC, USN, Naval Medical Research and Development  
Command, National Naval Medical Center, Bethesda, Maryland.

JULY

The Naval Dental Research Institute was visited by a group of dentists  
primarily from Central and South America. The group consisted of  
the following visitors:

Manual de Mena, Panama	Jorge Z. Noriega, Peru
Oswaldo Balenier Bustamante, Chile	Angela Rodriguez de Di Franco, Dominican Republic
Juan Carlos Gerbando, Argentina	Socorro V. de Palomino, Peru
Martha Bagnasco, Uruguay	Nelyda R. Campos, Colombia
Rosiemary de Solesa, Brasil	Myriam Anpsio Pulido Roza, Colombia
Jorge Hassan, Panama	Oswaldo Ruiz Merino, Ecuador
Adolfo Outes, Argentina	Josefa Orts Castera, Spain
Frank D. Nino, Colombia	Carlos Garcia Ballesta, Spain
Gustavo Romero, Colombia	Carlos A. Pasciullo, Argentina

DISTINGUISHED VISITORS (Continued)

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JULY (Continued)

Visitors primarily from Central and South America (continued):

Maria Enriqueta Escarza, Mexico	Mango L. Motto, Brasil
Terezinha Vasconcelos Campos, Brasil	Amoury Coetano de Meuezes, Brasil
Alacyr Beghimi de Moraes, Brasil	Luis Rivera, Venezuela
Maria Celina B. Siquara da Rocha, Brasil	Orildo Luiz Scheffer, Brasil
Victoria Ianer Macedu, Brasil	Waldir Viana Das Neves, Brasil
Maria Eugenia Tollendal, Brasil	Xavier Costa Codina, Spain
Fanny de Rivera, Venezuela	Maria Ines Bertucci, Uruguay
Javier Caminoc, Peru	Juan B. Martinez Franco, Dominican Republic
Raul Mejia, Colombia	



Dr. I. L. Shklair explaining microbiological techniques to the Latin American dentists touring NDRI.

DISTINGUISHED VISITORS (Continued)

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JULY (Continued)

LCDR S. A. Leone, DC, USN, Naval Medical Research Unit #3, Cairo, Egypt.

Captain J. Russotto, MC, USN, Commanding Officer, Naval Regional Medical Center, Great Lakes, Illinois.

Dr. J. Hefferren, American Dental Association, Chicago, Illinois.

Dr. S. Harper, American Dental Association, Chicago, Illinois.

Colonel Dr. Aly El Mowafy of the Egyptian Army, Cairo, Egypt.

Colonel D. V. Osborne, USAF/BSC, Senior Officer, Air Force Elements Command, Andrews Air Force Base, Washington, D. C.

AUGUST

LCDR C. A. Bookwalter, DC, USN, Branch Dental Clinic, United States Naval Station, Rota, Spain.

Colonel D. G. Brunner, U.S. Army, Commander, U.S. Army Health Care Studies and Clinical Investigations Activity, Fort Sam Houston, Texas.

Captain A. MacDonald, Commanding Officer, Recruiting Area Five, Great Lakes, Illinois.

The Inspector General, Dental, Rear Admiral C. J. McLeod, DC, USN inspected the Naval Dental Research Institute 26 August 1982. He was assisted by his Executive Assistant, LCDR R. J. Lindsay, MSC, USN and DTCM H. R. Moeller, USN.

SEPTEMBER

Mr. F. Toth and Ms. J. McClure, Medical Audiovisual Management, Naval Health Sciences Education and Training Command, National Naval Medical Center, Bethesda, Maryland.

LCDR W. Ayers, Naval Regional Medical Center, Great Lakes, Illinois.

LCDR Rockhill, Naval Medical Research and Development Command, National Naval Medical Center, Bethesda, Maryland.

Colonel Dr. Aly El Mowafy of the Egyptian Army, Cairo, Egypt.

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS

### CLINICAL INVESTIGATION DEPARTMENT

(Oral Diseases Division)

Evaluation of conservative pulp treatment for teeth with deep carious lesions was continued during FY82. Phase I or the diagnostic phase was completed during fiscal year 1981. The results of Phase I led to the defining of clinical criteria which are most valuable for predicting irreversible and reversible pulp disease. These criteria will be used retrospectively in the continuing Phase II study for the evaluation of methods and materials currently used in conservative pulp therapy. Additionally, the criteria will be used to select teeth with deep caries, but good healing potential, for Phase IV controlled studies.

Concerning Phase II or the long term assessment of current conservative pulp therapy, 1,177 teeth with deep carious lesions in 748 recruits have been examined. History of symptoms, radiographic evaluation and pulp test results have been recorded. Presently clinical diagnostic data from 990 teeth are still maintained in the deep carious lesions records file. The clinical data records for these teeth are grouped as listed in the table below. The other 187 teeth have been deleted from the files over the years since Phase II has been in effect.

Distribution of the Pulp Evaluation Records for 990  
Deep Carious Teeth According to File Location

File Location			
III "C", Caries 1/4-3/4 in Dentin	IV "U", Caries >3/4 in Dentin	V Apparent Exposure	VI Subsequent Treatment
84	700	163	43

Records for 700 teeth are in file IV, which is the location for teeth that have "U"-lesions or teeth with lesions wherein the decay has penetrated 3/4 the distance through dentin toward the pulp and did not radiographically appear to have penetrated the pulp chamber. These are the teeth which present the greatest dilemma for naval dental officers in rendering conservative pulp treatment. Thus, the main thrust of the NDRI evaluation of deep carious lesion treatment is focused on the "U"-lesion teeth or teeth in file IV. Records for 43 teeth are kept in file VI or the subsequent treatment file. These teeth received treatment after recruit training or had a second definitive treatment of their deep carious lesion.

# STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

## CLINICAL INVESTIGATION DEPARTMENT (Continued)

Distribution of treatment for 716 "U"-lesion teeth (file IV teeth) is listed in the table below. This is 16 more "U"-lesion teeth than listed in the above table. The difference is due to the fact that records for 16 teeth, originally located in file IV, are now located in file VI because the teeth received a second or subsequent definitive treatment.

### Distribution of Techniques for Treatment of 716 "U"-Lesions at the Recruit Dental Clinic, Great Lakes, Illinois

No Record of Treatment	All Caries Removed	Indirect Pulp Cap	Direct Pulp Cap	Pulpotomy	Root Canal Filling	Extraction
145	342	65	80	39	26	19

According to the table above, there was no record of treatment for 145 teeth. Some of these teeth may have been treated, but due to recruit company changes and failure to receive mailed recall responses, records are incomplete. Of the 571 teeth which received treatment, 487 teeth, or 85%, received conservative treatment of their "U"-lesions. Conservative treatment of these 571 teeth included permanent restorations. The primary intent is to study conservative treatment of deep carious lesions which radiographically appear to be very close to, but not exposing, the pulp. Using this approach one can understand why 15% of the "U"-lesion treatment was in the nonconservative categories of pulpotomy, root canal filling, and extraction.

As of April 1982, recall data for one or more annual recall examinations up to four years was available for 232 teeth. The success/failure designation for conservative treatment of these teeth is summarized below.

### Success Rates of Techniques for Treatment of "U"-Lesions at Recruit Dental Clinic, Great Lakes, Illinois

Recall Year	All Caries Removed		Indirect Pulp Cap		Direct Pulp Cap		All Treatment	
	%†	N	%	N	%	N	%	N
1	88	(110)	85	(26)	85	(26)	87	(163)
2	87	(67)	89	(9)	94	(16)	88	(92)
3	89	(46)	88	(8)	82	(11)	88	(65)
4	92	(24)	100	(11)	80	(5)	93	(40)

†Percent successful treatment of "U"-lesion teeth (number of teeth).

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### CLINICAL INVESTIGATION DEPARTMENT (Continued)

Failure criteria have been determined from formulation of clinical criteria predictive of irreversible pulpitis by Phase I results. These criteria are described in NDRI-PR 81-10, November 1981.

As can be seen in the above table, overall treatment success for the conservative techniques of all caries removed without pulp cap consideration (ACR), indirect pulp cap (IPC), and direct pulp cap (DPC) varied between 87 and 93% for the years one to four. The success rate may appear to have increased with time for ACR and IPC. As more data accumulates for these treatments in the later recall years, this trend may or may not be continued. Also of note concerning this point, there are examples of treatment being classified as failure at one recall interval only to become successful at a subsequent interval because the periodontal ligament (PDL) space was found to be resolving and there was no pain history sufficient to be classified as unsuccessful.

Chi square test of the data for ACR, IPC, and DPC showed there was no significant difference among these conservative treatments and recall years. Success was not dependent on the type of treatment. Thus, all the treatment material data for ACR, IPC, and DPC were grouped together as one type of treatment for correlation of the various materials with success or failure of treatment. The success rates outlined in the next four tables represent data from 232 teeth with at least one or more recall response.

Success Rates for Conservative Treatment of Deep Carious Lesions as a Function of Base Material on the Pulpal Floor of the Cavity Preparation

Recall Year	Dycal		Cavitec		IRM		All Treatment	
	%†	N	%	N	%	N	%	N
1	87	(130)	80	(10)	100	(3)	87	(143)
2	88	(74)	80	(5)	100	(2)	88	(81)
3	88	(57)	67	(3)	---	---	87	(60)
4	91	(33)	100	(4)	100	(1)	92	(38)

†Percent successful treatment (total number of teeth).

The above table presents the success rates for the base materials (base 1) placed on the pulpal floor of the cavity preparation. Dycal is still by far the most often used base 1 material. Its use was associated with 87 to 93% success. Cavitec was associated with more variable success or 67 to 100%. This is assumed to be the result of a much smaller number of annual recall data on hand.

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

CLINICAL INVESTIGATION DEPARTMENT (Continued)

Success Rates for Conservative Treatment of Deep Carious Lesions as  
a Function of an Intermediary Base Material

Recall Year	%†	None		Zinc Phosphate		Caulk IRM		All Treatment	
		N		%	N	%	N	%	N
1	87	(98)		75	(12)	86	(29)	86	(139)
2	86	(64)		71	(7)	100	(8)	86	(79)
3	88	(58)		50	(2)	100	(3)	87	(63)
4	93	(29)		100	(4)	100	(3)	94	(36)

†Percent successful treatment (total number of teeth).

The success rates for the base materials (base 2) used as an intermediary base between base 1 and the surface restorative material are presented above. The overwhelming majority of teeth were treated conservatively without a second base. The success rates of these teeth essentially duplicated the overall success rates for the three ACR, IPC, and DPC treatment types, years one through four, as presented earlier. The use of zinc phosphate as base 2 was associated with considerably more variable success or from 50 to 100. More data is needed for zinc phosphate as well as Caulk IRM in order to draw a conclusion.

Success Rates for Conservative Treatment of Deep Carious  
Lesions as a Function of Cavity Varnish

Recall Year	%†	None		Varnish		All Treatment	
		N		%	N	%	N
1	87	(30)		86	(115)	86	(145)
2	82	(17)		88	(64)	86	(81)
3	100	(8)		85	(55)	87	(63)
4	100	(7)		90	(30)	92	(37)

†Percent successful treatment (total number of teeth).

The data concerning the use of cavity varnish or lack of cavity varnish placement is presented above. At this time in the study there does not seem to be any real difference between the use of varnish or no use of varnish.

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

CLINICAL INVESTIGATION DEPARTMENT (Continued)

Success Rates for Conservative Treatment of Deep Carious Lesions as a Function of Restorative Material

Recall Year	Amalgam		Resin		All Treatment	
	%†	N	%	N	%	N
1	87	(133)	83	(12)	87	(145)
2	88	(68)	80	(15)	87	(83)
3	85	(55)	100	(8)	87	(63)
4	94	(34)	100	(3)	95	(37)

†Percent successful treatment (total number of teeth).

The above or last table regarding current results of NDRI's deep carious lesion study lists the data for the type of restorative material. Success rates varied between 87% and 94% for the use of amalgam and between 80% and 100% for the use of resin material. In consideration of the smaller data numbers for use of resin, there does not seem to be any real difference in success associated with these two restorative materials.

As more data accumulates, other treatment variables will be analyzed for their correlation with success of treatment. Also, the recall data in file III ("C"-lesions) and V (apparent exposure) will be presented.

In another study, a total of 596 recruits and 296 staff personnel have been examined at Great Lakes, Illinois since October 1979. Saliva samples were obtained from both recruit and nonrecruit subjects in an attempt to determine if the colony-forming units (CFU) of cariogenic microorganisms (i.e., *S. mutans*, lactobacillus) in saliva could be useful, along with dental disease indices and demographic characteristics, in predicting those most in need of dental caries treatment or those susceptible to dental caries affliction in the future. The prevalence of both dental caries and periodontal diseases in naval recruits and nonrecruits during 1979-82 was documented.

Naval recruits at Great Lakes, who were preselected for service school following recruit training, were found to have significantly lower salivary lactobacillus counts compared to randomly selected recruits. The lactobacillus counts were not predictive of caries prevalence since the caries history indices (i.e., DT, DS, DMFS) were not different between the service school selectees and the randoms. For purposes of identifying those recruits with increased caries indexes, the variables measured on the sample of recruits at Great Lakes have been mostly noncontributory. Part of the explanation for being unable to predict caries prevalence (and presumably caries incidence) might be related to the change in recruiting standards used by naval service recruiters or other changes in demographic characteristics of naval recruits at Great Lakes from 1979 to 1982.

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

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### CLINICAL INVESTIGATION DEPARTMENT (Continued)

It appears as though the prevalence of dental caries (DT, MT, FT, DMFT) among entering recruits significantly decreased from 1975 until 1982, while the prevalence of periodontal disease remained unchanged. The caries prevalence decrease in recent years parallels reports of civilian dental health surveys in the United States which have demonstrated a significant decrease in the prevalence of dental caries. The decrease has been largely attributed to the effects of public water fluoridation. Naval recruits, however, still present to the naval service with about twice the number of decayed teeth (DT) as their civilian counterparts. It is apparent that the amount of dental caries (DT) entering the naval service is still a problem for Navy Dental Corps personnel whose mission is to provide comprehensive treatment for the active duty forces.

Those recruits who entered the Navy with extensively decayed teeth (ULES), also had a much greater need for treatment of a less urgent nature (i.e., ALES, BLES, CLES) than those recruits who had initially no U-lesions. The counts of cariogenic bacteria in saliva, however, were not different between the two groups. The salivary counts of *S. mutans* and lactobacillus in saliva do not appear to be reliable predictors of caries prevalence in naval recruits. The use of plaque counts of these bacteria should not be discounted, however, as predictors of caries activity in naval recruits because of the lack of predictive power using salivary counts. The attempt to use salivary counts was based on the premise that dental clinicians could more easily and quickly use a predictive test based on saliva rather than the more intrusive and less expedient use of dental plaque samples.

Since 1979, we have also collected epidemiologic and microbiologic data from nonrecruit naval personnel staff at Great Lakes. The number of decayed teeth (DT) and tooth surfaces (DS) is significantly greater for recruits compared to nonrecruits. Using the Navy Periodontal Disease Index (NPDI) and the Calculus Surface Index (CSI) we categorized individuals into periodontal case types. With Comparative Time Values (CTV) from the Navy's Dental Information Retrieval System (DIRS), we have been able to estimate the relative time required to provide periodontal therapy. The staff personnel of our sample required about 1.26 times the amount of therapy (in minutes per 100 individuals) for periodontal disease as recruits. We estimated that about 8903 minutes of periodontal therapy were required for 100 recruits, while 11,216 minutes were estimated as being needed by 100 nonrecruits. Similar estimations were calculated for restorative treatment comparisons. On the basis of the distribution of decayed surfaces (DS), recruits needed more than twice the amount of time to complete their restorative treatment compared to nonrecruits.

The clinical importance in these calculations does not lie in the absolute value of time needed to complete periodontal or restorative care for an individual. Clinic managers, however, might be more interested in the relative differences in time needed to complete these services for large groups of individuals. It is also of interest to note that, from our calculations, it was estimated that periodontal therapy would consume an enormous amount of personnel resources compared to restorative care. The epidemiologic literature indicates that index measures of disease (in our case DT, DMFS, NPDI, etc.) always underestimate the prevalence and incidence of disease. With this in mind, the amount of absolute time (personnel resources) needed to provide complete treatment for naval personnel is alarmingly high.

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

CLINICAL INVESTIGATION DEPARTMENT (Continued)

In February 1982 a NDRI examiner collected epidemiologic data from 37 male and 43 female recruits at Orlando, Florida. Duplicate examinations were performed blindly on randomly selected recruits at the Recruit Inprocessing Facility at Orlando by dental officers of the Naval Regional Dental Center (NRDC). The dental caries index values obtained were extremely close (i.e., correlation (r) = 0.86 or better) between the NDRI-calibrated examiner and the Orlando-uncalibrated examiners.

A similar duplicate examination process was conducted comparing the dental caries index values obtained by a NDRI-calibrated examiner and by uncalibrated examiners at NRDC, Great Lakes. The correlation coefficients were 0.85 or better. Because of these analyses, it can be concluded with some confidence that examiners at NRDC, Orlando and Great Lakes were extremely close in the scoring of dental caries compared to a calibrated examiner from NDRI. Further dental epidemiologic studies conducted in the naval service could use the dental record (SF-603) as a relatively reliable dental caries data collection instrument.

The opportunity to examine randomly selected naval recruits in Orlando resulted in data with which the dental disease status of female and male recruits (during one week in February 1982) could be compared. Male recruits had a significantly increased number of carious tooth surfaces (DS) and had completed fewer years of formal education. The periodontal status (NPDI, CSI) of males and females at Orlando were not significantly different. In a further analysis of the Orlando data, when the sample was stratified by age groupings, older recruits had significantly increased dental caries experience (DMFS) values, and scored significantly higher on the Armed Forces Qualification Test (AFQT). However, the periodontal disease status (NPDI) was not statistically different for the different age groups. Because of the significantly increased Calculus Surface Index (CSI) scores for older recruits, the clinical significance of the NPDI might be important despite its statistical nonsignificance. The NPDI was increased for the 20-33 year old group; in terms of program planning, the relative increase of periodontal disease in older recruits could make a difference in the allocation of dental health care resources and for identifying those at-risk for further dental treatment during their naval careers. Further investigation of age as a risk factor for periodontal disease in naval recruits should be conducted. Since recruits at Orlando are recruited from different areas of the United States than recruits at Great Lakes, regional differences in disease prevalence might exist for the total population of naval recruits. From cursory examination the dental decay experience (DMFS) of Orlando recruits was considerably higher than for recruits at Great Lakes (1979-82) -- 23.98 surfaces versus 17.73 surfaces. The increased DMFS can probably be explained on the basis of an increased filled component (FS) of DMFS, which might be attributed to the differences between males and females at Orlando. Recruits at Orlando appear to have more missing teeth (MT) than Great Lakes' recruits. This latter analysis is risky, since Orlando recruits were only examined during one week while the Great Lakes data cover a three-year period of observation. Nevertheless, there are preliminary indications in these data (because of the relative differences in index values) that recruits at Orlando and Great Lakes exhibit some different dental disease characteristics.

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### CLINICAL INVESTIGATION DEPARTMENT (Continued)

In an attempt to appraise the efficacy of optical scan computer cards for purposes of forensic matching, missing and filled data from the dental records of randomly selected naval personnel for posterior teeth for 80 exams were entered on optical scan cards. These data were duplicated and one set was defined as to contain antemortem records and one set as postmortem. The data were made more realistic by having some treatment recorded in only one set. A program was written to rank order all antemortem records on the basis of the likelihood that the record matched a selected postmortem record. Two algorithms were studied, both of which operated in a somewhat different manner on information pertaining to: Hits - matching filled surfaces (FS) or missing teeth (MT); Omissions - FS or MT in postmortem record only; and Impossibilities - FS or MT in antemortem record only. Using one or both of the algorithms about 90% of all records were correctly matched by the second attempt. There do not appear to be any technical reasons why this matching technology cannot be applied to the population of deployed naval and marine personnel. Such a system would have the potential to greatly enhance the ability to rapidly identify the remains of military personnel in the mass casualty situation.

During FY82 a third card for optical scan computer entry was designed and manufactured. This card will allow data pertaining to periodontal disease status to be added directly to a computerized data base. Together with the DMFT cards developed in FY81, virtually all important aspects of oral disease can now be entered via an automated system, which decreases errors due to clerical manipulation of data.

The multivariate features of periodontal research are often times difficult to comprehend because of the methods used in data presentation. Tables and ordinary figures are not well suited to the multivariate situation, particularly when there are many factors and when it is the investigators intent to emphasize interactions rather than main effects. In order to provide an effective tool for the presentation of multivariate periodontal research and to graphically display the severity of periodontal disease, a computer program was written that would allow an investigator to specify the values of up to nine variables for each of two conditions (viz. treatment A and B, time A and B) and have that information displayed on two sets of nine scales. Unlike typical displays these scales were designed to provide strong visual cues as to the variables they are measuring. These plots can be produced in less than two minutes and offer periodontal researchers and clinicians a new method to summarize complex multivariable data. The graphical method can also be used clinically as a patient motivation and education instrument.

The evaluation of a therapeutic dental program was accomplished by determining the longevity of amalgam restorations. A group of dental records (SF-603) was abstracted and the data were analyzed to describe the natural history of amalgam restorations placed in teeth of young adults (ages 17-29 years) as a function of tooth type and surface coverage. The unit of measure was the first 1, 2, 3, and 4+-surface amalgam restoration identified in 300 randomly selected dental records. Restorations were followed through the dental record to determine changes in surface coverage or other outcomes -- extraction, endodontic therapy, crown placement -- which occurred over time. The lifespan of a restoration was considered to be the interval between initial placement and date of subsequent change or date of most recent examination. Measurements of lifespan were values

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### CLINICAL INVESTIGATION DEPARTMENT (Continued)

of minimal longevity. The mean lifespan for 831 total restorations was 4.25 yrs; 1-surface = 4.53, 2-surface = 4.51, 3-surface = 4.07, and 4+-surface = 3.14 years. The range for the various types of restorations was zero to 20 years of service without change. There were no differences in longevity for restorations placed in anatomically different teeth (i.e., molars vs premolars). Restorations which changed (N=152, 18%) had a mean lifespan of 3.22 years; 122 (or 80%) of these were replaced, repaired, or had additional surfaces placed within a four-year period. Of the 831 restorations, 303 (or 36%) exceeded the mean minimum-lifespan of 4.25 years. Only 12 (4%) of the restorations in the study resulted in extraction of the tooth. It was concluded that dental practitioners might expect amalgam restorations placed under the clinical conditions of the practice of dentistry in the Navy to have a minimal-lifespan of over four years.

The data were subjected to life table analyses -- similar to survival analysis techniques used by life insurance carriers. It was determined that 50 percent of the amalgam restorations (in both molars and premolars) for our sample survived for 15 years. Further research on the effects of other dental therapeutic measures should be pursued.

In order to determine if information contained in dental records could identify persons at high risk for deep lesions, a review of 631 charts was undertaken at the time of a recall examination. Of 423 persons who had no caries at the last appointment, 66 percent were still disease free at the recall examination. Of persons found to have U-lesions, 92 percent had one or more diseased surfaces (DS) after the last appointment. In contrast to dental classification, DS value exhibits satisfactory levels of sensitivity and specificity when used as a selection criterion for high dental emergency risk individuals. Given a contingency situation where limited resources do not permit universal annual examinations, patient selection on the basis of DS level represents a viable alternative.

Additional research was directed towards the development of statistical methodology that would increase the sensitivity of analyses of data collected at NDRI. Issues addressed included the nature of confidence intervals of dental epidemiological data, analysis of covariance as applied to comparative DMFS trials, the selection of independent variables in multiple regression, the problem of the correlated nature of data from sites with a single mouth, and vector analysis of the angulation of unerupted third molars. Definite conclusions and recommendations are described in several manuscripts.

A study was undertaken to provide descriptive information about what happened to third molars in one group of 300 randomly selected naval personnel. About 60% of the third molars present in entering naval personnel (average age 19.6 years) were unerupted. Ninety-one percent of maxillary third molars and 80% of mandibular third molars were located on their expected normal path of eruption. This was represented by vertically and distoangularly inclined maxillary third molars and vertically and mesioangularly inclined mandibular third molars. Six hundred and forty-six third molars were unerupted and 274 of these were extracted. About 50%, or 185 of the unerupted teeth remaining, erupted during the period under study. Whether a third molar was extracted was related to whether it was erupted. Third molars were less likely to have been extracted if they were erupted initially or had erupted during the period under study. Finally, the overall rate of extraction decreased with age while the reason for extraction was more likely to have been

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### CLINICAL INVESTIGATION DEPARTMENT (Continued)

related to symptomatic conditions as age increased. The study provided information concerning past treatment trends and revealed areas which will require future evaluation. Further studies are necessary to complete the descriptive dental history of third molars, to establish early signs leading to subsequent pathological conditions, and to further clarify when third molars may be safely retained. Further analysis of the data collected in this study are being conducted to address some of these questions.

The quality and nature of fluoride (F) in interproximal plaque was measured during a 15 day period after increase of communal water F from 0.3 ppm to 1.0 ppm. Two plaque samples, obtained 15 days apart for each of 23 naval recruits, were assayed for F using a perchloric acid microdiffusion extraction method. Depending upon his date of arrival at Great Lakes, each recruit consumed 0.3 ppm F water for anywhere from 1 to 16 days prior to the date of F increase to 1.0 ppm. Sampling was timed such that initial plaque specimens were all obtained one to two days after each recruit's arrival, during which he had consumed base water at 0.3 ppm F. The proximity of the initial sampling day to the date of water F change determined how many days each subject was exposed to the increased level of 1.0 ppm F before his 15th day plaque sampling. Thus, the 15th day specimens represented different periods of opportunity for plaque F uptake. Linear correlation analysis demonstrated a progressive, daily net increase (Figure 1) in total plaque F, showing a correlation coefficient of 0.51, which was statistically significant ( $p < 0.02$ ). The nature of the total plaque F component responsible for the rise was the unbound (water-soluble) fraction (Figure 2) which showed a significant ( $p < 0.01$ ) correlation coefficient of 0.53. The bound F (acid-extract) fraction (Figure 3) did not increase. Least squares linear regression indicated that the magnitude of unbound F increase in interproximal plaque was 0.38 ng F/mg plaque (wet weight) daily for up to 15 days after communal water F was increased from 0.3 to 1.0 ppm.

RELATIONSHIP BETWEEN DAYS OF EXPOSURE TO  
1 ppm F COMMUNAL WATER AND NET CHANGE  
IN CONCENTRATION OF TOTAL F IN PLAQUE

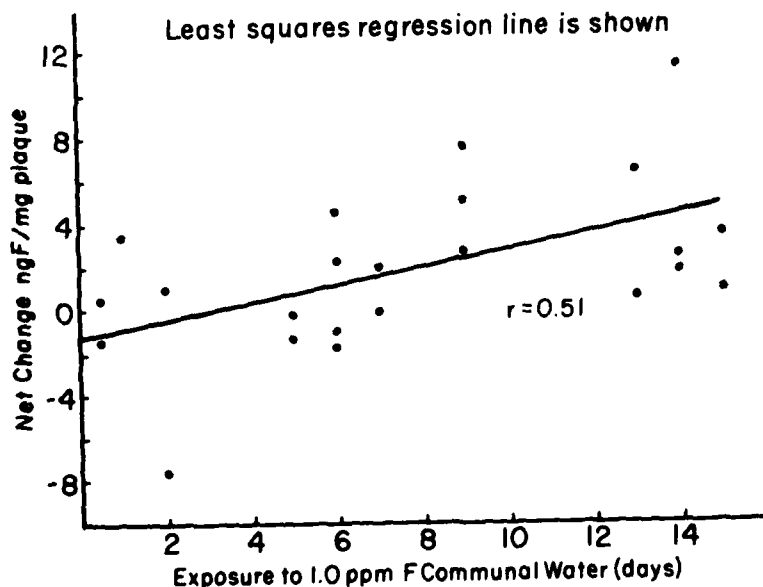


Figure 1

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

CLINICAL INVESTIGATION DEPARTMENT (Continued)

RELATIONSHIP BETWEEN DAYS OF EXPOSURE TO  
1 ppm F COMMUNAL WATER AND NET CHANGE  
IN CONCENTRATION OF UNBOUND (water-soluble)  
F IN PLAQUE

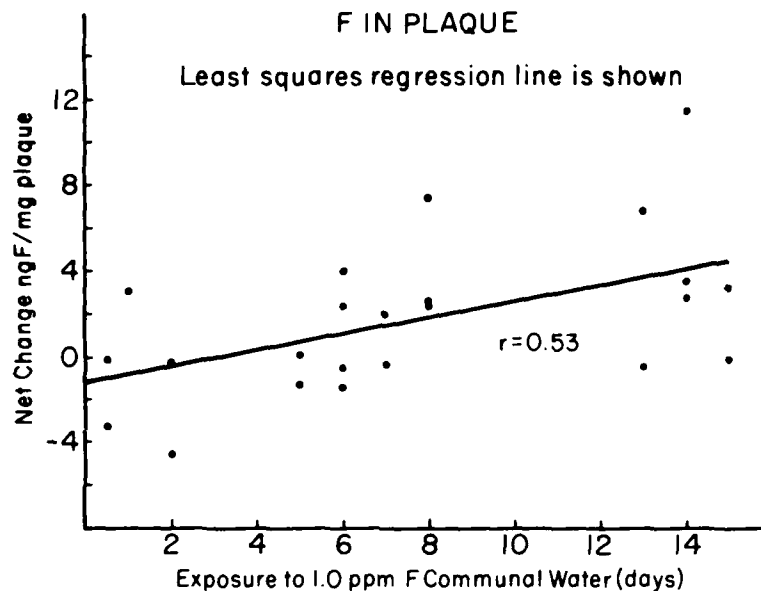


Figure 2

RELATIONSHIP BETWEEN DAYS OF EXPOSURE TO  
1 ppm F COMMUNAL WATER AND NET CHANGE  
IN CONCENTRATION OF BOUND (acid-extract)  
F IN PLAQUE

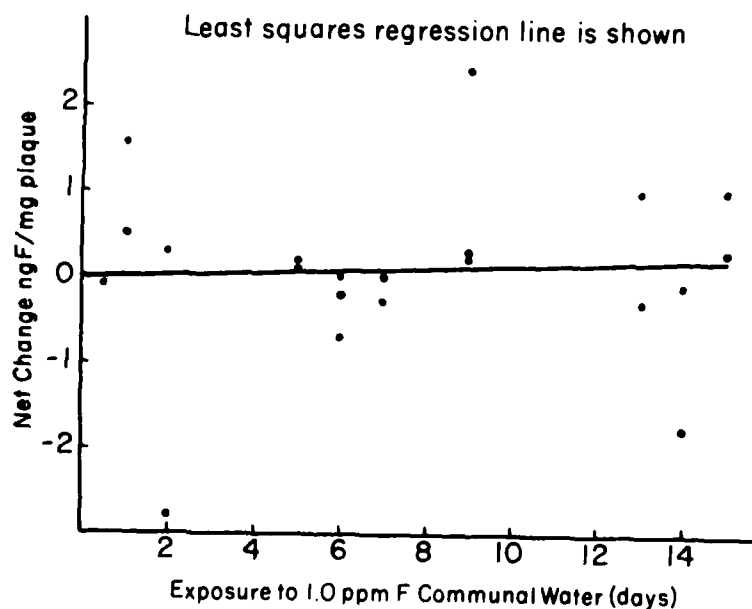


Figure 3

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### CLINICAL INVESTIGATION DEPARTMENT (Continued)

An exhaustive and critical survey of the literature pertaining to the utility of stannous fluoride ( $\text{SnF}_2$ ) in its various accepted forms of application was performed. Review and interpretation suggests that  $\text{SnF}_2$  preparations are probably superior to sodium fluoride ( $\text{NaF}$ ) agents in terms of caries arrestment and periodontal disease control in young adults. A workshop, comprised of expert consultants in preventive dentistry was convened to provide state-of-the-art guidance for revision of Navy preventive dentistry policy in this regard. These evolutions provided the basis for three reports. Recommendations included:

1. Development of a more comprehensive epidemiologic program for defining the distribution and rates of dental disease in the Navy population. Inclusive in such a program should be the establishment of feedback systems to monitor the effects of preventive treatment modes rendered.
2. Fluoridation of drinking water on naval vessels as well as at naval facilities.
3. Lavaging of teeth prepared for restoration with fluoride agents.
4. Recommend daily self-application of fluoride-containing mouthrinses and dentifrices as part of routine patient counseling.
5. Specifically orient the intensity of preventive dentistry treatment to address differing degrees of susceptibility among naval personnel. In this regard, identify high risk personnel and provide additional corrective preventive dentistry measures inclusive of high concentration topical fluoride agents at every treatment visit and home use of fluoride preparations of more interventive potential than those routinely recommended.
6. Perform longitudinal studies at the operational level to define the efficacy of fluoride agents which presently appear to have the capacity for arrestment of existing caries and periodontal disease progress.

In response to recommendations emanating from this project, the Navy's preventive dentistry program is being revised and upgraded. In support of further refinement, preventive dentistry and epidemiologic studies have been designed, proposed and approved for implementation in FY83 at this Institute.

(Health Management Division)

In 1979 a mock-up of an 8'x8'x20' shipping container was constructed and outfitted with two dental operatories. Field equipment included in the Authorized Dental Allowance Lists (ADAL) 660 and 661 were procured for Phase I of the Marine Corps Expeditionary Shelter System (MCESS) dental facility. Changes in these lists were made in FY81 and FY82 by the NDRI project manager. One major change was the

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### CLINICAL INVESTIGATION DEPARTMENT (Continued)

deletion of the field dental chair and portable treatment delivery cart and replacement of these items with a more compact chair system and an over-the-patient delivery unit.

Phase I clinical trials in the mock-up were completed at NDRI by early FY82. The modified ADAL was restocked and readied for shipment to a site for testing. An operational manual has been compiled to familiarize the Assistant Dental Officer with the unique duties and responsibilities involved in operating the shelter in support of Marine Corps operations.

Under direction of Headquarters, Marine Corps, the Phase I Marine Corps Authorized Dental Allowance List (ADAL) 660 and 661 equipment, was tested and modified by the Naval Dental Research Institute (NDRI) and transported to Brunswick Corporation.

In FY82 an 8'x8'x20' knockdown Marine Corps Expeditionary Shelter from the Marine Corps Development and Education Command (MCDEC) was obtained and put into operational order as a two operator dental facility on NDRI grounds. A utility panel containing water intake and outlet, telephone terminals, and auxiliary electrical power box was designed, assembled and installed in the shelter. Another panel was designed to receive a casement style air conditioner, which was installed. Further deletions and additions were made on the (ADAL) 660 and 661 equipment.

This experimental Phase II field dental gear was moved from the mock-up to the shelter and preliminary trials were run to check for discrepancies in the utilities hookup. Authorized Dental Allowance Lists (ADAL) 662 through 665 equipment was added with changes to the Phase II inventory. ADAL 660 and 661 were deleted.

The experimental portable dental chair was modified to allow it to function as a field expedient operating table. The chair's back reclines to a complete supine position and is designed to fit a NATO stretcher. An IV bag/bottle holder was designed and built to mount on the support post and an arm rest was altered with restraining straps to aid intravenous administration. Add-on electrical appliance capacity was increased by installing a four-outlet box on the support post stabilizing bracket. To further enhance the chair's compactness and portability, the foot rest was made detachable to allow it to fit a shortened storage case. A metal skid was constructed to be set under the chair to prevent instability in soft ground. A complete set of engineering and assembly drawings of the chair was made at this stage of development.

The 1981-82 winter at Great Lakes Naval Base was exceptionally severe, reaching a low of -27°F with a windchill of -80°F during a five-week cold spell. This is equivalent to the previously selected cold weather test site of Bridgeport, California. Temperatures taken at this time inside the shelter measured 60°F with two standard stock space heaters, allowing the dental treatment to be performed on patients in a comfortable environment. Exterior water does not drain completely from the shelter overhead. This has provided an environment for mosquito breeding. At the drain ports located at the rear end panel of the shelter, paint is peeling apparently due from undermining by water and ice.

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### CLINICAL INVESTIGATION DEPARTMENT (Continued)

A comparative clinical study of pin-retained amalgam restorations and preformed stainless steel crown restorations was conducted on volunteer recruit patients at the Naval Regional Dental Center, Great Lakes, IL. The purpose is to determine the chairside treatment time required and the natural history of the teeth treated by either technique. Permanent molars with extensive caries were selected for the study. Both treatment methods are considered to be intermediary restorations. Six dental officers attended a didactic and laboratory course on the placement of stainless steel crowns and actively participated in the clinical phase. The treatment method was selected randomly at the time of appointment. Clinical evaluation criteria, as established by Ryge, were applied at the time of restoration placement to indicate the quality of the completed restoration and the condition of the tooth and supporting tissues. Twelve stainless steel crowns and 17 pin-retained amalgams were completed. These will be evaluated annually for a period of three years after placement. Functionality and health of the tissues will be determined from the clinical evaluation criteria used at the initial examination and included in the annual observations. A data entry form will be provided for the dental officer at the subject's dental facility and returned to NDRI after each annual examination. For statistical validity, more subjects must be included in the study. Therefore the clinical phase will continue in FY83. As of March 1983, the first recall data in the project will be collected.

A portable dental chair for adult patients was designed and constructed from two wall corrugated cardboard. It will support a 300 pound patient in either a sitting or a prone position. A doctor's stool is included in the design and when disassembled, the stool parts function as a support for the backrest when it is raised to the sitting position. No glue is used in assembly. The disassembled components fold into a compact package which measures 40"x26"x5". The combined weight, including a cardboard carrying case, is 27 pounds.

Four types of commercially available facial protection shields (N=60) used by police, firemen and military personnel, were subjected to laboratory tests to determine their capability of attenuating traumatic assaults common in the battle zone. Two styles were formed from 1/8" polycarbonate (Lexan™) and the other two styles of 1/8" acrylic (Butyrate™). None of the shields passed the flammability test using Federal Standard 406. All shields subjected to ballistics testing using a fragment simulator projectile and MIL-STD-662 are unable to stop penetration by high velocity fragments and small arms rounds. The four types distorted under a 40-foot pound impact with a blunt object, allowing the force to be transmitted to the face area of the test head form. Visual distortion caused by the polycarbonate shields was 2.5%. Acrylic shields averaged 7.5% distortion. There was no distortion through 1/8" plate glass used as a standard. Light transmission measured 88% through polycarbonate and 82% through acrylic. Transmission through glass was 94%. All styles were subjected to 24 hours conditioning at 150°F, relative humidity 95 to 100%. The same test samples were then subjected to minus 70°F for 24 hours. There were no signs of deterioration. Light reflection averaged 2.6% for polycarbonate, 2% for acrylic and 8% for the glass slab standard. A flat surface was more reflective than a curved surface. Fragments from a shattered shield may penetrate and imbed in body tissues. These can, with difficulty, be observed in a radiograph of the wound.

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

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CLINICAL INVESTIGATION DEPARTMENT (Continued)

The test results indicate that the four styles of face shields evaluated would be inadequate protection in combat and suggest the need for development of new materials and design.

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

SCIENTIFIC INVESTIGATION DEPARTMENT

(Microbiology Division)

Streptococcus mutans, the decay causing bacterium, produces an enzyme, glucosyltransferase (GTF), that can split sucrose to produce a water-insoluble sticky glucan that is related to the organism's ability to cause decay. The inhibition of GTF activity was proposed as a means of reducing the cariogenicity of S. mutans. A variety of compounds were tested in vitro for their ability to inhibit GTF activity. Five surfactants were found to be effective in vitro GTF inhibitors at low concentrations.

These five compounds, benzethonium chloride (BC), sodium lauryl sulfate (SLS), cetylpyridinium bromide (CPC), methyl benzethonium chloride (MBC), and cetylpyridinium bromide (CB), were tested to determine if they can prevent, or significantly reduce caries in a hamster model system. The hamsters were infected with S. mutans #6715 and fed diet 2000 which contains 56% sucrose. The organism was tested for its ability to synthesize soluble and insoluble glucans prior to initial implantation and at the end of the experiment. Tooth surfaces were swabbed three times a week with the compound at concentrations ranging from 0.005 to 0.5 percent.

Only the animals treated with 0.5 percent SLS had significantly ( $P > 0.05$ ) reduced caries activity. However, the numbers of S. mutans isolated were essentially the same as for the other groups, including the positive controls. Additionally, the amounts of glucans synthesized by the S. mutans from this and other groups did not significantly differ ( $P > 0.05$ ) from the organisms initially implanted. It was concluded that the effectiveness of the 0.5 percent SLS in reducing caries resulted from an in vivo inhibition of the S. mutans GTF activity.

Bacterial glucans have been highly correlated with cariogenic dental plaque and dental caries. Methods were explored for modifying glucan dispersing enzymes, dextranase and  $\alpha$ -1, 3-glucanase, so that they would have prolonged caries-preventive activity in vivo by an improved affinity for tooth surfaces. One method for increasing the retention time of enzymes in the mouth is to chemically conjugate them to a carrier molecule that has a natural affinity for the tooth surface. Since the molecular carrier is the component which would adhere to the enamel surface, a comparison of the elution characteristics of two possible carriers was determined. One carrier,  $\alpha$ -casein, was found to release from hydroxyapatite powder at buffer concentrations between 0.5 M and 0.9 M. A second carrier phosvitin, was found to release at phosphate buffer concentrations ranging from 1.0 M to 1.6 M. Since the phosvitin was eluted at the higher molar ranges it was considered to be a better carrier. Experiments were performed to evaluate a compound, N-succinimidyl 3-(2-pyridyldithio) propionate (SPDP), a covalent coupling agent as a means of coupling dextranase to a phosvitin carrier. This resulting conjugate should represent an enzyme preparation with a greatly increased affinity for dental enamel surfaces. The SPDP was found to cause a major shift to a high molecular weight in the elution volume of Penicillium dextranase (PD) in a gel chromatography column after it was coupled with phosvitin which indicated conjugate formation had occurred. This PD conjugate remained active when compared to the initial enzyme activity and had a greater affinity for hydroxyapatite than the PD alone.

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

In order to test the enzymes in animal and clinical trials, large amounts of the enzymes are needed. An attempt was made to synthesize large batches (12 L) of both  $\alpha$ -1, 3-glucanase and dextranase in a fermentor. Triton X-100 and pourite were added to increase enzyme production and reduce foaming. Enzyme activity was negligible in this system. A four L batch, treated with ammonium sulfate, had a 35 percent yield of  $\alpha$ -1, 3-glucanase. This low yield made the processing by conventional methods very inefficient. To overcome this problem, a Millipore cassette system (ultrafiltration by tangential flow) was used. Results with this system showed a 300 to 500 percent increase in recovered yields.

The  $\alpha$ -1, 3-glucanase is a very promising caries-preventive agent since it focuses on a most crucial and specific pathogenic aspect of dental caries control. However, only a few laboratories in the world have ever reported an enzyme which can degrade these water-insoluble glucans. This laboratory is the only one in the United States which presently has the capability of producing this enzyme. There is some recent evidence (Guggenheim, et al., *Caries Res.* 14:128-135, 1980) that a similar enzyme can be effective in the oral cavity due to receptors which will retain the enzyme in place. They found that the enzyme was effective for reducing both smooth-surface and fissure caries in rats. We intend to test the enzyme in a human clinical trial for its ability to prevent or retard dental caries and periodontal disease.

Bacterial aggregation on tooth surfaces is also an important pathogenic aspect of dental disease progression.

A new technique was developed to assess the effect of water-insoluble streptococcal glucans on bacterial cell-to-glucan and glucan-to-glucan accumulation. In place of hydroxyapatite disks, insoluble glucan disks were used. It was found that both caries-active and caries-free saliva were not important factors in the accumulation ("plaque forming") process, when used to coat the insoluble glucan disks. *S. mutans* serotype d/g disks were found to be colonized to a greater extent by type d/g cells. This phenomenon was amplified further in the presence of sucrose. An understanding of the accumulation process could lead to specific methods of interference, thereby reducing or preventing cariogenic dental plaque and dental caries.

Recent studies have emphasized the role of fibronectin (FN), a glycoprotein, as a mediator of the body's reticuloendothelial system (RES). The RES system consists of sessile phagocytic cells in the various organs of the body and circulating phagocytic cells of the blood which serve as the body's primary defense mechanism against shock and infections. Plasma FN serves as an opsonin for these phagocytic cells and functions by coating foreign particles and bacteria and enhancing the phagocytosis of those particles.

Although FN is known to exist on the oral mucosa, its distribution in the oral cavity is not well understood nor its relationship to oral disease. In order to investigate its distribution in the oral cavity, an enzyme-linked immunoabsorbant assay (ELISA) for the detection of FN was developed. The system developed is very specific and sensitive (to 10 ng FN/ml). There are currently only two commercial

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

assays for FN on the market; the ELISA we have developed is at least ten times more sensitive than either of these tests. We are currently using several techniques to enhance the sensitivity and specificity of the FN-ELISA.

Utilizing the assay, very low levels of FN in the saliva have been detected. Technical difficulties, however, have prevented an accurate quantitation of these levels. These studies are continuing in hopes of resolving these difficulties.

Fibronectin is also known to inhibit the attachment of certain bacterial pathogens to host epithelium. In an effort to investigate this phenomenon in the oral cavity, the binding of FN to bacterial endotoxin, the complex lipopolysaccharides from the cell wall of Gram-negative bacteria, was examined. It was found that FN does not bind to the endotoxin, which may partially explain the inhibition of attachment of these bacteria to mucosal surfaces. This phenomenon will be further investigated in the coming year.

The microorganism Pseudomonas aeruginosa is frequently isolated from burns, war wounds, and hospital acquired infections. These clinical pathogenic strains possess virulence characteristics -- specific enzymes, fimbriae, and an ability to adhere to epithelial cells -- that are lacking in free-living cells. About ten percent of healthy naval personnel are carriers of this organism in their saliva. However, it is not known if these salivary strains have virulence characteristics similar to the clinical or free-living soil and water strains. Fifteen salivary strains from healthy naval subjects and fifteen clinical isolates were compared for their disease causing potential.

The enzymes, elastase, lecithinase, and coagulase were present significantly ( $p < 0.05$ ) more often in the clinical isolates than the salivary isolates. There was also a trend toward a greater frequency of production of fibrinolysin in the clinical isolates when compared to the salivary group. The other enzymes tested -- protease (caseinase), gelatinase, lipase, DNase, hemolysin, chondroitinase and hyaluronidase -- did not show significant statistical differences between the two groups. All strains demonstrated protease and gelatinase activity, and all but one of the 30 strains demonstrated hemolysis. None of the strains showed chondroitinase or hyaluronidase activity. More than two-thirds of all strains had lipase activity, and about half the strains demonstrated DNase activity. Three of the 15 salivary strains possessed pathogenic enzyme profiles similar to the clinical strains. These strains may have the potential for being pathogenic given the right clinical conditions, i.e., injury or burn, although this remains to be determined.

Another important virulence factor is the ability of an organism to adhere to the mucosal surfaces of the host. If bacteria are unable to adhere to host epithelium the various host defense mechanisms such as saliva, mucous, and other fluids will simply wash the bacteria from the surface prior to causing disease. It is not surprising, therefore, that representative clinical strains of Pseudomonas attached to a greater degree to human buccal epithelium than the salivary strains.

Similarly, the presence of fimbriae on the clinical isolates correlates well with the ability to attach to epithelial cells. These fimbriae are thought to

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

mediate the attachment of the bacteria to host epithelium. The fimbriae of Ps. aeruginosa were found to be approximately 7-10 nm and to vary in length. They appeared only at the poles of the cell near the single polar flagella.

The presence of these fimbriae primarily on the clinical strains, rather than on the salivary strains, further supports the conclusion that adherence to host epithelium is an important virulence factor in Pseudomonas.

The above data suggests that the Ps. aeruginosa strains isolated from the saliva of healthy naval personnel can usually be considered to be nonpathogenic. However, a few strains may have the potential to cause disease by serving as a foci for subsequent infections.

(Biochemistry/Cell Biology Division)

The salivary antibacterial factor, hypothiocyanite ( $\text{OSCN}^-$ ), is produced through the oxidation of thiocyanate ( $\text{SCN}^-$ ) by bacterial hydrogen peroxide. This reaction is catalyzed by salivary lactoperoxidase (LPO). During the past year we have completed an investigation, initiated during FY81, of the relationship of salivary  $\text{OSCN}^-$  levels to dental caries experience. Our goal was (1) to determine whether levels of  $\text{OSCN}^-$  differed for caries-free and caries-active young adult subjects, and also (2) to elucidate interrelations among factors affecting salivary  $\text{OSCN}^-$  production in these subjects. Unstimulated whole saliva samples were collected from 29 caries-free and 29 caries-active recruits along with information on subject smoking habits. Each sample was analyzed immediately after collection for  $\text{OSCN}^-$  and several factors that might affect  $\text{OSCN}^-$  level. The data are summarized in the table below.

Comparison of Salivary Peroxidase System Components and Affecting Variables in Caries-Free and Caries-Active Subjects

Variable	Caries-Free (29)		Caries-Active (29)	
	Mean	S.D.	Mean	S.D.
Flow Rate (ml/min)	0.29	0.21	0.29	0.19
pH	6.88	0.27	6.91	0.29
$\text{OSCN}^-$ ( $\mu\text{M}$ )	47.1	26.0	49.3	24.0
$\text{SCN}^-$ (mM)	1.46	0.86	1.45	0.73
LPO (mU/ml)	123.9	66.0	168.3	101.9

STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

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SCIENTIFIC INVESTIGATION DEPARTMENT (Continued)

Statistical analysis showed that none of the variables were significantly different at the .05 level for the caries-free and caries-active subjects. Hence, there was no evidence from the study to suggest that OSCN functions to a significant degree as a protective factor against dental caries among caries-free individuals.

The interrelations among the variables were then evaluated statistically from the data for the total group of 58 subjects. Flow rates and pH were found to be negatively correlated with SCN, while SCN and OSCN were negatively correlated with LPO activity. When the total group was divided into smoker (34)/non-smoker (24) groups, evaluation of the data showed positive correlations between smoking and levels of OSCN and SCN, along with a negative correlation of smoking and LPO activity.

We have also, during FY82, initiated a study of the mechanisms of initial attachment of oral organisms to tooth surfaces. This study is based on work of other laboratories that have postulated at least two possible means -- electrostatic attraction and carbohydrate/protein interactions -- by which initial attachment may be accomplished. Our tests have measured the adherence of tritium-labelled organisms to hydroxyapatite disks. Preliminary data, acquired with Streptococcus mutans strains NCTC 10449 and OMZ 176, and Streptococcus sanguis (mitis) ATCC 10557, have shown widely varying responses among the organisms, suggesting that they possess differing mechanisms of initial attachment. The presence or absence of a saliva coating on the disks commonly affects the attachment. Whole saliva, for example, produced a decrease in adherence of 56% and 14% respectively for the NCTC 10449 and OMZ 176 strains, but an increase of 75% for the ATCC 10557 strain, in comparisons to control disks exposed to buffered KCl, pH 6.8. Other tests conducted with parotid and submaxillary saliva samples in place of the whole saliva also showed different effects on the adherence of these strains.

The abilities of various sugars and sugar derivatives to reduce adherence of the strains were then examined. The test agents were mannose, galactose, L-fucose, D-mannosamine, D-galactosamine, D-glucosamine, and glucose. All of these agents are components of glycoproteins, hence could possibly be involved in carbohydrate/protein interactions that might occur between bacteria and salivary proteins. However, although glucosamine appeared to be slightly effective toward reducing adherence of the Strep. mutans strains, none of the differences produced by the test agents were statistically significant.

Another study is in progress to determine the influence on bacterial adherence of basic and acidic polypeptides -- e.g., polylysine, polyarginine, polyglutamic acid, and polyaspartic acid -- which bind strongly to hydroxyapatite. Preliminary data have shown markedly different results with these compounds, apparently because of electrostatic charge effects.

## STATEMENT OF SIGNIFICANT ACCOMPLISHMENTS (Continued)

### ADMINISTRATIVE DEPARTMENT

Fiscal year 1982 can be viewed as a period of dynamic review, change, transition, and challenge in all divisions.

The Fiscal/Supply Division undertook the massive task of totally reviewing its accounting procedures. This resulted in increased efficiency, accuracy, and timeliness of management reports. In turn, this has proved to better serve the fiscal/supply needs of the research mission.

The Operating Management Division conducted a thorough plant property and investment equipment inventory. Custody cards and maintenance records were initiated on each piece of equipment. An equipment acquisition, maintenance, and disposition program was instituted under the auspices of the Dental Repair Technician. A systemized equipment replacement program was started, which will result in improved budget preparation and in the routine replacement of equipment as useful life expires. Equipment service contracts were reviewed and significant maintenance was placed under the responsibility of the Naval Regional Medical Center's Biomedical Repair Technicians with whom an interservice agreement exists. Facility renovation was begun and/or budgeted for in the coming months. Audiovisual procedures were reviewed and inventory tasks enhanced to facilitate easier and more accurate reporting. Cost-effectiveness has become an ever increasing concern and has motivated cost analysis studies of all utility services. Significant savings in telephone service has already been achieved and other utility savings are envisioned in the coming months.

The Administrative Services Branch has experienced creditable growth and progress throughout the past year. Report tickler files have been updated to better ensure report completion and thoroughness of work. The Navy Directive System has been updated for the first time in several years. Part of the general military training requirements are now being incorporated into the Plan of the Day, which affords daily exposure to all hands. Several individuals, officer and enlisted are engaged in off-duty educational pursuits.

It has been an exciting year with notable growth and challenge and leaving many projects to be completed in the coming year.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS,  
DEPARTURES AND REENLISTMENTS

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OCTOBER

DT1 S. M. BENSHOOF reenlisted for a period of four years.

DT2 S. L. TAYLOR was selected NDRI's Sailor of the Quarter.

Captain D. W. TURNER was inducted as a Fellow, International College of Dentists, Kansas City, Missouri.

NOVEMBER

Captain G. E. CLARK was appointed as the Treasurer of the Chicago Section, American Association for Dental Research.

DT3 M. P. GOLDING received a Good Conduct Award.

Ms. E. D. POWELL was promoted to GS-7 Biological Laboratory Technician.

DECEMBER

A Certificate of Commendation for outstanding performance was received by the following personnel:

Dr. M. E. COHEN  
Ms. J. J. RAMIREZ

Ms. M. J. ROUSE  
Dr. L. G. SIMONSON

DTC R. L. DOUGLASS was advanced to E-8.

LT B. R. MERRELL received a Navy Achievement Medal.

Ms. J. J. RAMIREZ resigned from the Fiscal/Supply Division.

Captain D. W. TURNER was appointed Associate Professor, Department of Periodontics, University of Illinois, Chicago, Illinois.

JANUARY

DN D. E. THOMAS was selected NDRI's Sailor of the Quarter.

LCDR W. J. FRY retired from active duty.

DT1 W. V. REESE received the Lake County Council Navy League Award.

FEBRUARY

Mr. J. A. FARNAN joined the staff of the Fiscal/Supply Division.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES,  
AND REENLISTMENTS (Continued)

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MARCH

DA G. W. DALM reported for duty from the School of Dental Assisting and Technology, San Diego, California.

Ms. M. B. EDWARDS resigned from the Office Services Branch, Administrative Service Division.

Ms. N. HUERTAS resigned from the Veterinary Sciences/Pathology Division.

LT J. J. HYMAN reported for duty from the National Naval Dental Center, Bethesda, Maryland.

Ms. M. J. ROUSE received a Certificate of Commendation for outstanding performance.

Dr. I. L. SHKLAIR was re-elected as Program Chairman of the International Association for Dental Research/American Association for Dental Research for the Microbiology/Immunology Section.



Captain D. W. Turner presenting a letter of nomination to DT2 S. L. Taylor for NDRI's "Sailor of the Year".

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES,  
AND REENLISTMENTS (Continued)

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APRIL

LCDR J. A. BENNY reported for duty from the School of Dental Assisting and Technology, San Diego, California.

Ms. P. E. CLARKE joined the staff of the Office Services Branch, Administrative Service Division.

Mr. D. K. LENKOSKI joined the staff of the Veterinary Sciences/Pathology Division.

HM2 D. A. REIHER was selected NDRI's Sailor of the Quarter.

DT2 S. L. TAYLOR was nominated NDRI's Sailor of the Year.

MAY

The following personnel were awarded the Small Arms Qualification Ribbon, Sharpshooter:

LT J. J. HYMAN  
CDR R. G. WALTER

LCDR F. AKER received a Letter of Appreciation from the Naval Regional Medical Center, Great Lakes, Illinois.

CDR R. S. BAYCAR was awarded the Small Arms Qualification Ribbon, Expert.

DT1 S. W. BOCKOWSKI received a Letter of Appreciation from the Commanding Officer upon his detachment from NDRI for duty at the Naval Medical Research Unit #3, Cairo, Egypt.

CDR J. C. CECIL received a Letter of Appreciation from the Commanding Officer upon his departure from NDRI for duty at the Naval Regional Dental Center, Norfolk, Virginia.

DA G. W. DALM was advanced to E-3.

DN G. W. DALM received a Letter of Appreciation from the Commanding Officer, Naval Regional Medical Center, Great Lakes, Illinois.

CDR R. G. ESQUIRE received a Letter of Appreciation from the Commanding Officer, Naval Regional Dental Center, San Diego, California for outstanding contributions as a lecturer in the continuing education program in Preventive Dentistry and Patient Motivation.

DT1 W. V. REESE was selected for in-service procurement in the Medical Service Corps and was appointed to the rank of Lieutenant Junior Grade.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES,  
AND REENLISTMENTS (Continued)

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MAY (Continued)

LTJG W. V. REESE received a Letter of Appreciation from the Commanding Officer upon his departure from NDRI for duty at the Naval Regional Dental Center, Norfolk, Virginia.

LCDR D. C. SCHROEDER received a Letter of Commendation from the Commanding Officer, Naval Regional Medical Center, Great Lakes, Illinois for her most competent assistance as Course Assistant/Lecturer at the Combat Casualty Care Course.

LCDR D. C. SCHROEDER received a Letter of Appreciation from the Commanding Officer upon her departure from NDRI for duty at the Naval Regional Medical Center, Oakland, California.

Mr. A. SEROWSKI received a Sustained Superior Performance Award.

Dr. L. G. SIMONSON and Dr. B. L. LAMBERTS were assigned U.S. Patent #4,328,313 "Method for Producing α-1, 3-Glucanase".



Captain D. W. Turner swearing in LTJG W. V. Reese in the Medical Service Corps, U.S. Navy at the commissioning ceremony.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES,  
AND REENLISTMENTS (Continued)

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JUNE

The following personnel received a Letter of Appreciation for their performance during a flood at NDRI:

DT1 S. M. BENSHOOF  
TSgt A. J. HORTON  
DT1 S. R. HOEFS

DN W. V. STROUD  
DN D. E. THOMAS

DT1 W. F. BRUTON reported for duty from the Naval Education Training Center, Newport, Rhode Island.

LCDR M. C. DIEHL reported for duty from the Branch Dental Clinic, United States Naval Station, Rota, Spain.

LCDR M. C. DIEHL received a Letter of Appreciation from the Commanding Officer, United States Naval Regional Dental Center, Naples, Italy.

DT2 S. R. HOEFS was frocked to E-6.

DT1 M. L. MINTEN received a Letter of Appreciation from the Commanding Officer, NDRI upon his release from active duty.



Captain D. W. Turner presenting Ms. M. J. Rouse with a Certificate of Nomination for Federal Employee of the Year, Chicago Metropolitan Area.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES,  
AND REENLISTMENTS (Continued)

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JUNE (Continued)

LCDR S. J. PATCH reported for duty from the Naval Regional Dental Center, Camp Pendleton, California.

Ms. M. J. ROUSE was nominated for Federal Employee of the Year, Chicago Federal Executive Board.

DT2 S. L. TAYLOR was frocked to E-6.

DN D. E. THOMAS was frocked to E-4.

JULY

LCDR F. AKER received a Letter of Appreciation from the Commanding Officer upon his detachment from NDRI for duty at the Marine Corps Command and Staff College, Quantico, Virginia.

DT3 T. J. BARNES was selected NDRI's Sailor of the Quarter.

CDR R. G. ESQUIRE received a Letter of Appreciation from the Chief, Dental Division, Bureau of Medicine and Surgery, Washington, D. C.

LT J. R. KELLY reported for duty from the USS Dixie (AD-14).

AUGUST

The following personnel qualified for the Navy Expert Rifle and Pistol Marksmanship medal:

LCDR M. C. DIEHL  
CDR R. G. ESQUIRE

CDR R. S. BAYCAR qualified for the Navy Expert Rifle Marksmanship medal.

DT1 S. R. HOEFS received a Letter of Appreciation from the Commander, Naval Training Center, Great Lakes, Illinois.

HM1 E. W. LARSON received a Letter of Appreciation from the Commanding Officer, Naval Regional Dental Center, Great Lakes, Illinois.

DT2 P. TOMBASCO reported for duty from the Naval School of Health Sciences Detachment, Fort Sam Houston, Texas.

DT3 E. L. TUTEN reported for duty from the Naval School of Health Sciences Detachment, Fort Sam Houston, Texas.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES,  
AND REENLISTMENTS (Continued)

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SEPTEMBER

A Change of Command/Retirement Ceremony was held at the Naval Dental Research Institute 17 September 1982. Captain D. W. Turner, DC, USN retired and was relieved by Captain G. E. Clark, DC, USN as the Commanding Officer of the Naval Dental Research Institute.

LCDR J. A. BENNY received a Letter of Appreciation from the Commanding Officer, NDRI.

LCDR J. A. BENNY was appointed to the Planning Committee of the Great Lakes Women Officers' Network.

LCDR J. A. BENNY was appointed to sit on the Navy Enlisted Classification Review Board at the Surgeon General's Annual Specialty Advisory Conference Committee meeting in Bethesda, Maryland.

DTCS R. L. DOUGLASS received a Letter of Appreciation from the Commanding Officer, NDRI.



Captain G. E. Clark, DC, USN reading his orders at the Naval Dental Research Institute Change of Command, 17 September 1982. Looking on are Lieutenant F. Elkin, CHC, USNR; Captain D. W. Turner, DC, USN; RADM P. W. Willis III, MC, USNR-R; and Captain G. M. McWalter, DC, USN.

HONORS, AWARDS, POSITIONS HELD, CEREMONIES, STAFF ARRIVALS, DEPARTURES,  
AND REENLISTMENTS (Continued)

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SEPTEMBER (Continued)

DT2 R. GIBBS reported for duty from the Naval School of Health Sciences  
Detachment, Fort Sam Houston, Texas.

DT1 S. R. HOEFS reenlisted for a period of two years.

Ms. S. J. KLINE received a Sustained Superior Performance Award.

Ms. S. J. KLINE was promoted to GS-6 Secretary (Steno).

Dr. L. G. SIMONSON and Dr. B. L. LAMBERTS received patent awards for U.S.  
Patent #4,328,313 "Method for Producing  $\alpha$ -1, 3-Glucanase".

DN D. E. THOMAS was advanced to E-4.

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